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Remarks

Claims 1-3, 8, 10-20, 31-32, 39-41, 43, 48, and 57-68 are pending in the application. Claims 9, 21-30, 33-38, 42, and 44-47, have been withdrawn pending allowance of generic claims 1 and 39. Claims 49-56 were previously canceled. Claim 4 is canceled by virtue of this amendment. Claims 1, 8-10, 24, 39, 40, 43, 44, 57-59, and 65-67 have been amended. New claim 68 has been added. No new matter has been added by virtue of this amendment. Reconsideration of the application as amended is requested.

**Claim Rejections--35 U.S.C. § 102**

The Examiner rejects claims 1-4 under 35 U.S.C. § 102(e), as being anticipated by Nurmikko '725. However, claim 1, as amended provides:

1. An electronic system, comprising a single device and an external magnetic field, said single device having a light emitting portion, a hot electron emitting portion, a magnetically sensitive portion, and an energy barrier, wherein said magnetically sensitive portion includes a first magnetically permeable layer and a second magnetically permeable layer, wherein said energy barrier blocks most thermalized electrons from traveling from said magnetically sensitive portion to said light emitting portion, wherein magnetization state of said first magnetically permeable layer is aligned with magnetization state of said second magnetically permeable layer when said external magnetic field extends in a first direction, and wherein magnetization state of said first magnetically permeable layer is anti-aligned with magnetization state of said second magnetically permeable layer when said external magnetic field extends in a second direction opposite said first direction.

Nurmikko does not teach or suggest an energy barrier between the magnetically sensitive portion and the light emitting portion that "blocks most thermalized electrons from traveling from said magnetically sensitive portion to said light emitting portion."

Nurmikko cannot have such energy barrier because such a barrier would block his diffusive and drift current flow to his forward biased light emitting diode. No electrons would reach the light emitting diode, and no light would be emitted by Nurmikko device: it would not function for its intended purpose. As the Jiang paper states, "only electrons that maintain enough energy to surmount the Schottky barrier at the base/collector interface and that can find available states in the conduction band of the semiconductor collector are collected." Thermalized electrons would not have that energy.

Since Nurmikko's device functions with diffusive or drift electron flow—thermalized electron flow—Nurmikko requires an ohmic contact, not an energy

barrier that blocks most thermalized electrons from traveling from said magnetically sensitive portion to said light emitting portion..

Therefore, the rejection of claim 1, as amended, and claims dependent thereon, as anticipated by Nurimikko under 35 U.S.C. § 102(e) has been traversed.

#### **Claim Rejections—35 U.S.C. § 103(a)**

The Examiner rejects claims 1-8, 10-20, 31-32, 39-41, 43, 48, 57, 59, and 60 under 35 U.S.C. § 103(a), as being unpatentable over Nurmikko in view of Sato '143.

First, applicant would respectfully ask the Examiner to consider that Sato teaches a three terminal device and Nurmikko provides a two terminal device. Further invention would be needed to provide the three terminal device teachings of Sato into the two terminal device of Nurmikko. It would not be obvious to one of ordinary skill (a) to combine the three terminal device of Sato with the two terminal device of Nurmikko or (b) how to combine their distinct teachings.

Applicant would further respectfully ask the Examiner to consider that while Sato teaches a hot electron spin valve transistor that is a single device, he does not teach or suggest light emission: Sato's device provides electron flow into an n type collector. Thus, there is no recombination of electrons with holes. Thus, there is no light emission in Sato.

Nurmikko has light emission but Nurimikko does not teach or suggest the limit of claim 1, which provides an energy barrier between the magnetically sensitive portion and the light emitting portion that "blocks most thermalized electrons from traveling from said magnetically sensitive portion to said light emitting portion." Providing such an energy barrier in Nurmikko would cut off his light emission as described under the response to the 102(e) rejection and as described in the Jiang paper.

To summarize, further invention would be required to consider the idea of replacing the two terminal device of Nurmikko with the three terminal transistor of Sato, to add the rectifying barrier to block the diffusion and drift current flow of Nurmikko while providing the hot electron flow of Sato, all while retaining the light emission of Nurmikko.

Furthermore, replacing the two terminal device of Nurmikko with a three terminal device would add the need for making a third contact. Further invention would be needed to provide that third contact consistent with the purpose of Nurmikko, who seeks to combine his Vertical Cavity Surface Emitting Laser (VCSEL) and his Magneto-Optoelectronic Device (MOD) to be monolithically integrated as one epitaxially layered

stack, as shown in his FIG. 4. Otherwise that purpose would be defeated.

Thus, the rejection of claim 1, and claims dependent thereon under 35 U.S.C. § 103(a), as being unpatentable over Nurmikko in view of Sato '143 has been traversed.

Similarly, neither reference, individually or in combination, teaches or suggests the limits of claim 39, as amended, which provides:

39. An electronic system, comprising a metal base hot carrier transistor and a source of external magnetic field, said metal base hot carrier transistor having a metal base and a collector, wherein an **energy barrier is between said metal base and said collector to block thermalized carriers in said metal base from traveling to said collector, said collector having a p region and an n region** for facilitating light emission, said metal base hot carrier transistor further comprising a magnetically sensitive portion including a first magnetically permeable layer and a second magnetically permeable layer, wherein said source of external magnetic field is positioned to intersect said magnetically sensitive portion wherein a **change in said external magnetic field switches magnetization state of said second magnetically permeable layer without switching magnetization state of said first magnetically permeable layer.**

Neither Sato nor Nurmikko teaches or suggests a collector having a p region and an n region for facilitating light emission.

With his n type collector, Sato has no recombination of electrons flowing into the collector and therefore no light emission.

Nurmikko provides a two terminal device, not a transistor.

Nurmikko has no hot electron transport. Nurmikko only has thermalized carrier current flow. Blocking that flow, as in claim 39, by providing the energy barrier, would block all his carriers from reaching his light emitting diode. Further invention would be required because simply modifying Nurmikko to provide hot carrier transport, such as by replacing the two terminal device of Nurmikko with the three terminal transistor of Sato, would eliminate the light emission of Nurmikko. Even further invention would be needed to add the p and n regions in the collector. It was applicant who was first to recognize and disclose that invention.

Furthermore, replacing the two terminal device of Nurmikko with a three terminal device would add the need for making a third contact. Further invention would be needed to provide that third contact consistent with the purpose of Nurmikko, who seeks to combine his Vertical Cavity Surface Emitting Laser (VCSEL) and his Magneto-Optoelectronic Device (MOD) to be monolithically integrated as one epitaxially layered

stack, as shown in his FIG. 4. Otherwise that purpose would be defeated.

Thus, the rejection of claim 39, and claims dependent thereon under 35 U.S.C. § 103(a), as being unpatentable over Nurmikko in view of Sato '143 has been traversed.

The Examiner rejects claims 1-8, 10-20, 31-32, 39-41, 43, 47, 48, 57, 59, and 60 under 35 U.S.C. § 103(a), as being unpatentable over Jiang in view of Nurmikko.

As to claim 1, Jiang does not teach or suggest, "wherein magnetization state of said first magnetically permeable layer is aligned with magnetization state of said second magnetically permeable layer when said external magnetic field extends in a first direction, and wherein magnetization state of said first magnetically permeable layer is anti-aligned with magnetization state of said second magnetically permeable layer when said external magnetic field extends in a second direction opposite said first direction."

Jiang has the magnetization of both of his magnetically permeable layers always aligned with each other. There is no teaching or suggestion in Jiang to provide anti-alignment of magnetization states. Regardless of direction of his magnetic field, magnetizations of both layers in Jiang are aligned with each other. If his system were to be modified to provide that they were to be anti-aligned the current to Jiang's collector would be reduced and the signal for his analysis would be reduced, reducing its sensitivity, defeating the purpose of Jiang. Because Jiang's purpose of analyzing polarization of electrons just before they recombine in the collector would be degraded by magnetizations anti-aligned it would not be obvious to replace his two layers with their aligned magnetizations with layers that have magnetization that are ever anti-aligned.

Furthermore, Nurmikko provides a two terminal device that relies on diffusion and drift electron flow. Jiang teaches against a two terminal device by providing for a hot electron transistor and by explaining that hot electrons can surpass the barrier of his transistor--which could not be accomplished with the two terminal device of Nurmikko, as further described herein above. In view of Jiang's teaching, it would not be obvious to combine the teachings of Nurmikko with those of Jiang.

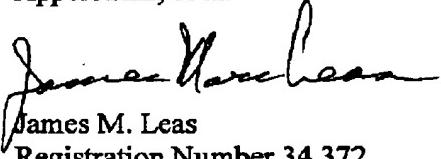
Furthermore, Nurmikko has a different purpose than Jiang. While Jiang is analyzing the polarization of the light as an indicator of the polarization of electrons in the semiconductor just before recombination, Nurmikko is providing a device for sensing changes in a magnetic field. It would not be obvious to combine devices having disparate purposes. Only by hindsight from the present invention does reason for combining their teachings appear.

Therefore, the rejection of claims 1 and 39, and claims dependent thereon under 35 U.S.C. § 103(a) as being unpatentable over Jiang in view of Nurmikko has been

traversed.

It is believed that the claims are in condition for allowance. Therefore, applicant respectfully requests favorable reconsideration. If there are any questions please call applicant's agent at 802 864-1575.

Respectfully submitted,  
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